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Is there positive in the negative? Understanding the role of guilt and shame in physical activity self-regulation

Abstract

The high rate of global physical inactivity has led researchers to explore the psychological variables that impact physical activity (PA) behaviours. Drawing from tenets of control theory and literature on self-conscious emotions, the current study investigated the experience of guilt and shame in response to engaged in and missed PA. One hundred and fifty-four adults ($M_{age} = 34.02$, $SD = 12.27$) completed online questionnaires over a three-week period. Paired sample t -tests showed participants experience more guilt and shame after a missed intended PA session than an engaged-in session and, of the two, guilt is felt more strongly ($t(150) = 8.31$, $p < .001$). Following a missed PA session, attribution dimensions were explored; locus of causality was associated with guilt ($p = .02$) and stability with shame ($p = .01$). Logistic regressions showed guilt had a negative relationship with PA intentions, and guilt and shame did not predict future PA. This finding is at odds with control theory and past empirical evidence. This disparity suggests the need for future research to explore these emotions within the PA domain to further inform the nature of their relationship. This research was the first to measure and explore the acute, real-life experience and motivational qualities of guilt and shame relative to PA engagement. Research implications and future directions are discussed.

Keywords: Guilt, shame, physical activity, self-regulation, control theory

1 **Introduction**

2 The contemporary concern about global low physical activity (PA) rates is well documented, and
 3 physical inactivity has been cited as the fourth leading risk factor of global mortality (World
 4 Health Organization, 2017). In response to these high rates of inactivity, there is a recognized
 5 need for the development of PA interventions and for health care providers to promote PA
 6 participation and adherence (Gates, 2015). However, those attempting to promote PA face
 7 difficulties producing long term effects (Michie, Abraham, Whittington, Mcateer, & Gupta,
 8 2009). In order to increase the effectiveness of PA interventions, it is important to understand the
 9 psychological variables that predict PA (Baranowski, Anderson, & Carmack, 1998; Bryan,
 10 Hutchison, Seals, & Allen, 2007). Emotions are recognized for their direct influence on the self-
 11 regulation of goal-directed behaviour (Baumeister, Stillwell, & Heatherton, 1994) including PA
 12 (Stryker & Burke, 2000). Understanding the role of emotions in the self-regulation of PA may
 13 inform intervention efforts (Flora, Strachan, Brawley, & Spink, 2012).

14 Control theory (Carver & Scheier, 1982) is influential in the study of self-regulation and
 15 offers an explanation of how the experience of emotions may facilitate successful goal
 16 attainment. When pursuing a goal, people make assessments of their current state and compare
 17 this to their desired state. Negative emotions result when the comparison detects a discrepancy
 18 (Carver & Scheier, 1982). These negative emotions signal unsatisfactory goal progress and
 19 should inspire increased effort at self-regulation to meet the goal (de Ridder & Wit, 2006) as a
 20 means of alleviating the negative emotions. According to this theory, when exercisers perceive
 21 that they have not progressed towards their PA goal (e.g., skipped a PA session), they should
 22 experience negative emotions which motivate the subsequent behaviours (e.g., resumed PA).

23 Control theory traditionally does not differentiate between different types of negative
 24 emotions or their differential implications for self-regulation. The growing literature on self-

conscious emotions may augment control theory in explaining the role of emotion in self-regulation. Self-conscious emotions are experienced when an event elicits feelings about personal attributes or behaviours (Tangney, 1996). These emotions provide critical self-relevant feedback. This feedback influences motivation, thoughts, feelings, and behaviours (Dijkstra & Buunk, 2008; Hynie, MacDonald, & Marques, 2006; Tangney, 2003) and has implications for self-regulation. Of particular relevance to self-regulation are negative self-conscious emotions. These emotions guide our behaviour and elicit a self-evaluation of our personal standards (Tangney, 2003). The specific negative self-conscious emotions that are thought to play the largest role in PA self-regulation are guilt and shame (Dijkstra & Buunk, 2008; Sabiston et al., 2010).

Guilt and shame

According to Lewis (1971), guilt and shame are related but conceptually distinct self-conscious emotions. While self-evaluative processes are required to elicit both feelings of guilt and shame (Tracy & Robins, 2004), the specific focus of the evaluation will provoke one or the other. Shame is experienced when the global *self* is the object of evaluation (e.g., ‘I am a bad person’) whereas guilt is felt when the *behaviour*, or the bad thing done, is the focus of the emotion, not the self (Baumeister et al., 1994; Lewis, 1971). Guilt and shame have also been distinguished in terms of their attributions, or appraisals, of an event (Tracy & Robins, 2004;2006). Tracy and Robins (2004) present a process model of self-conscious emotions which provides a framework outlining the attributions associated with each of the emotions. It is proposed that shame is caused by internal, global and stable attributions whereas guilt results when a cause is perceived as being internal, unstable, and specific to the self (Tracy & Robins, 2004). Although not acknowledged within the model, the attributional dimension of controllability (extent to which the cause of an event can be changed) has been found to uniquely affect these two emotions, with

uncontrollability (i.e., ability) being associated with shame, and controllability (i.e., effort), with guilt (Tracey and Robins, 2006).

Shame and guilt can also be differentiated in terms of their motivational influences; shame motivates people toward separation and distance from the situation and guilt motivates people in a constructive, proactive, future-oriented direction (Tangney, 2003; Tracy & Robins, 2004). These identified differences in the attributions and behavioural outcomes associated with guilt and shame make a convincing case that the constructs are separable and unique.

Guilt, shame and physical activity behaviours

The characteristics of these two emotions suggest they may each play a unique role in PA behaviours and this insight may help inform efforts in enhancing PA. Research exploring the impact of guilt and shame on PA behaviours is minimal, however the studies that have been conducted provide strong evidence for their influence. Guilt has been found to be more strongly associated with motivations to exercise than shame (Sabiston et al., 2010). More specifically, body-related guilt and shame have been found to be associated with differing forms of PA motivation. Body-related shame was associated with low levels of PA motivations and behaviour in cancer survivors (Castonguay, Wrosch, Pila, & Sabiston, 2017) and in a male population body-related guilt and shame were each associated with different forms of motivational regulations (Castonguay, Pila, Wrosch, & Sabiston, 2015).

While the results offer preliminary support for the role of guilt and shame in PA participation, several research gaps remain. Based on the contemporary view of guilt and shame being conceptually separate, the individual assessment of each emotion is recommended to tease out the similarities between the two emotions (Tracy & Robins, 2004). Although some researchers treat these emotions as separate constructs (Castonguay et al., 2015; Castonguay et al., 2017; Sabiston et al., 2010), they have done so in the context of guilt and shame as an

objectification of the body rather than a reflection of the behaviour (i.e., PA). To advance the notion posited by control theory (Carver & Scheier, 1982), the emotions experienced in relation to PA behavioural engagement, and their subsequent effects requires further investigation. Secondly, it is recognized that trait levels of guilt and shame can impact state levels (Tangney, 1996) yet the trait levels of the emotions are not always captured in research. Given that trait levels of these variables can influence how people respond, recommendations by Eisenberg (2000) should be followed, such that trait levels of these emotions are accounted for when assessing state levels of guilt and shame. Further, research on guilt and shame in PA contexts is limited given its reliance on hypothetical scenarios or general response tendencies, which have limited external validity, and further work should be conducted in the real-world context. Finally, no research has examined the antecedents and consequences of guilt and shame relative to a PA failure; doing so would aid in understanding when these emotions occur, their implications and if these emotions function distinctly in a PA context.

The purpose of this study was to explore the experiences of guilt and shame in individuals relative to their recent PA behaviour and to determine if these emotions are distinct from each other in this context. Based on the self-conscious emotions literature and the theoretical propositions of control theory, it was reasoned that guilt and shame would act as separate emotions and this would be reflected by several hypotheses:

- (1) Exercisers would experience more guilt and shame on days when they missed an intended PA session, compared to when they engaged in their intended PA session.
- (2) When participants missed a PA session, it was expected that they would experience greater guilt than shame due to the missed PA session; the reasoning being that a missed PA session involves an evaluation of the behaviour rather than the self.

(3) Guilt would be positively related to the attribution dimension of internal locus of causality and personal control, while negatively related to stability. Shame would be positively related to internal locus of causality and stability but negatively related to personal control.

(4) Guilt would motivate future intentions and re-engagement with PA behaviour, while shame would result in disengagement.

Understanding the role that guilt and shame play in PA self-regulation may provide useful information to researchers and practitioners seeking to improve PA interventions.

Methods

Design and participants

This study employed an online, observational design. The eligibility questionnaire confirmed participants were aged 18-65 years, engaged in at least one 15-minute bout of PA in the past week with the intention of being active in the coming three weeks. Participants also needed to report freedom from current injury that would limit their PA participation, and proficiency with reading and writing in English (please see supplementary material for eligibility questionnaire). Our total sample of 154 participants consisted mainly of adult women (81.4%) with a mean age of 34.02 years ($SD = 12.27$). Most participants identified themselves as Caucasian (76.4%) and close to half of the sample were single (43.6%), married (43.6%), worked full time (50%) and had an undergraduate education (44.3%). Participants reported an average of 218.68 ($SD = 145.94$) minutes of moderate to vigorous PA per week, which exceeds recommended levels of PA (World Health Organization, 2017).

Measures

Socio demographic information was collected on participants' gender, age, cultural background, marital status, education, and current employment status.

Trait shame and guilt

The Test of Self Conscious Affect (TOSCA 3) scale was used to measure trait guilt and shame, which were used as control variables within this study. The TOSCA 3 (Tangney & Dearing, 2002) is composed of scenarios yielding indicators of shame proneness, guilt proneness and pride proneness. The final score for guilt and shame proneness was derived by summing the responses provided on the scale for each emotion separately. Pride proneness was not included in analysis. The TOSCA 3 has reported alphas of .77–.88 for shame-proneness and .70 for guilt-proneness (Tangney & Dearing, 2002). The present study reported alphas of .73 and .69 for shame and guilt-proneness respectively (see Table 1 for reporting of alpha values of all variables), therefore following recommendations by Peterson (2000), no items were removed.

State shame and guilt

State shame and guilt were assessed by the State Shame and Guilt Scale (SGSS; Marschall, Saftner, & Tangney, 1994). The questionnaire is comprised of 15 statements; five statements for each emotion of shame, guilt and pride that participants rate on a five-point Likert scale (1-not feeling this way at all; 5-feeling this way very strongly), such as “I feel remorse, regret” in the instance of measuring guilt. The final score for each state emotion was derived by summing the responses provided on the scale for each emotion separately. State pride was not included in analysis. This measure is one of the few scales that measures shame and guilt as separate emotions and has been shown to reliably capture the emotion felt in the *moment* (Tangney & Dearing, 2002). Recommendations were taken by Tangney (1996) to administer the questionnaire to explicitly refer to the specific behaviour in question (recent PA). Further, without the direct use

of the words *guilt* and *shame* this measure did not rely on participants' abilities to distinguish between the two emotions. A study done by Marschall (1996) found the internal reliability for shame and guilt to be .89 and .82 respectively.

Attributions

The Causal Dimension Scale II (CDS-II; McAuley, Duncan, & Russell, 1992) was used to measure respondents' causal attributions for their missed PA. The CDS-II has been revised from the original version and consists of 12 questions about the cause of an event that respondents rate on a semantic differential scale. It includes the four causal dimensions of locus of causality ("is the cause something that reflects an aspect of yourself or the situation"), stability ("is the cause something that is permanent or temporary"), personal control ("is the cause something that is manageable by you or not manageable by you"), and external control ("is the cause something that other people can regulate or other people cannot regulate"). However, the current study aims to provide evidence for the literature and therefore only measures the three dimensions theorized to be associated with guilt and shame (hypothesis 3). Therefore, external control is not included in analysis. The respondents' score for each dimension was derived by summing the questions associated with the appropriate dimension. Values could range from 3-27 with higher values representing attributions that are more internal, stable and either personally or externally controllable. The CDS-II has been shown to have acceptable consistency and validity. Reliability has been reported with a range of .60-.82 across the four dimensions (McAuley et al., 1992).

Strength of physical activity intentions

Participants were asked to indicate the date of their next intended PA session. Knowledge of this date allowed researchers to determine when to contact participants to inquire if they had engaged in their intended PA. Participants were asked to indicate their *strength* of intentions to engage in

this intended PA session using a 9-point Likert scale (1-definitely will not be physically active; 9-definitely will be physically active).

Self-reported physical activity levels

The Godin Leisure Time Exercise Questionnaire (GLTEQ; Godin & Shephard, 1985) typically asks participants to indicate the number of 15-minute bouts of mild, moderate, and strenuous PA they engaged in over the past month during their free time. For the current study, we asked participants to report their PA on a day that they reported they had engaged in their intended PA session. In order to create a categorical variable representing whether or not people engaged in PA, participants who reported one or more 15-minute bouts of PA at any intensity were categorized as having engaged in PA; those who failed to report any of these bouts were categorized as not having engaged in PA. The GLTEQ has been shown to be a valid (Jacobs, Ainsworth, Hartman, & Leon, 1993) and reliable (Godin & Shephard, 1985) measurement tool and is a popular resource used to measure PA behaviour within health behaviour research (Berry & Strachan, 2013; Sabiston et al., 2010).

Procedures

Ethical approval was granted from a university ethics subcommittee in a large Canadian city. Participants were recruited via posters, newsletters and exercise classes. To provide incentive for study participation, a small honorarium was offered to participants upon study completion. Potential participants received a brief description of the study and prior to study enrolment completed an online questionnaire to ensure they met eligibility criteria. The questionnaire only let them continue onto the consenting process once eligibility was confirmed. Upon completion of informed consent, participants provided demographic information, PA levels and trait guilt and shame data.

Each participant was required to provide their reactions to a day when they did not ('no' day) and a day they did ('yes' day) engage in an intended PA session. In order to attain these two sets of responses from each participant, they were asked to indicate the date of their next intended PA session and strength of this intention. Participants were emailed on these intended PA days and asked if they engaged in PA until both sets of responses were fulfilled, or up to three weeks. The duration between follow up intervals varied between participants depending on frequency of intended exercise. For instance, where in some cases participants were contacted daily, others may have been every few days, as determined by the timing of their next intended exercise session. Once participants had completed the study they were thanked for their time and thoroughly debriefed. The specific procedures for a 'yes' and a 'no' day are outlined below, in turn (also see Figure 1).

No day

When participants reported they did not engage in PA on an intended PA day, their reactions to having missed this intended PA session were assessed. Specifically, levels of state guilt, shame, and attributions were assessed. Participants' intentions for their next intended PA session were again assessed. On the next intended PA day, the process was repeated, and the participants were asked if they engaged in their intended PA. This was to assess whether participants took reparative action after a missed PA session.

Yes day

When participants reported that they did engage in PA on an intended PA day their reactions to having engaged in this PA session were assessed; specifically, their levels of state guilt, shame, and their intentions for future PA. On the next intended PA day, the process was repeated to fulfill both sets of responses.

[Insert Figure 1 here]

Data management and analysis

Recommendations by Tabachnick and Fidell (2014) and Pallant (2016) guided the data cleaning and preparation process. The data was examined for univariate outliers by creating a standardized z-score for each variable. Z-scores outside the range of ± 3.29 were changed to one unit larger or smaller than the next most extreme score and values greater/less than 3.29 were transformed according to current recommendations (Tabachnick & Fidell, 2014). Data were assessed for normality by examining skewness and kurtosis values. Missingness was assessed using Little's MCAR test and it was determined the data was missing at random ($\chi^2 = 106.34(127)$, $p = .91$). Missing data was imputed using missing values analysis. Missing data was not imputed for entire questionnaires. Participants who failed to complete an entire questionnaire were excluded from analyses involving that measure; this resulted in varying sample sizes for each analysis, explained below. Assumption testing was completed, and all assumptions were met. Data was assessed for linearity, multi-collinearity and singularity with the necessary variables before conducting the regressions. None of the items loaded under 0.1 when assessing for tolerance or over ten for the variance inflation factor. To tease apart guilt and shame, recommendations from guilt and shame researchers were followed (e.g. Sabiston et al., 2010; Tangney & Dearing, 2002); state shame-free guilt (SF guilt) and state guilt-free shame (GF shame) were created by running a regression analysis with the state guilt and shame variables and saving the resulting residuals. The Durbin Watson Statistic scored over the 1.0 cutoff (1.94), providing evidence that the residuals were independent of one another. The new variables were used in the regression analyses. To correct for the inflation of type I error due to multiple measures, a Bonferroni correction (Miller, 1966) was undertaken. Alpha levels were set at .05. The corrected p values are reported where applicable.

A total sample of 234 participants were deemed eligible and were observed for three weeks. However, 80 of these participants failed to report a 'no' day (needed for our analyses) and were excluded from any future analyses. Due to ten participants not completing all the required questionnaires, sample sizes differed between analyses. A total of nine participants did not report a 'yes' day and were excluded from any analyses requiring a 'yes' response. This left a valid sample of 154 participants for analyses requiring a 'no' response and 145 participants for analyses requiring a 'yes' and 'no' response.

A paired sample *t*-test was employed to compare levels of guilt on a 'no' day to a 'yes' day. Another paired sample *t*-test compared levels of shame on a 'no' day to a 'yes' day (hypothesis 1). This required the inclusion of participants that reported their state guilt and shame on a 'yes' and 'no' day. Of the 145 participants that were eligible for this analysis, two participants failed to report their levels of state guilt and shame, therefore 143 participants were included.

A paired sample *t*-test was used to analyze and compare the levels of guilt to the levels of shame on a 'no' day (hypothesis 2). This required the inclusion of individuals that reported their state guilt and shame on a 'no' day. Of the 154 participants that were eligible for this analysis, three participants failed to report their levels of state guilt and shame on a 'no' day, therefore 151 participants were included.

Two regression analyses were used to examine the relationship of SF guilt and GF shame with the causal dimensions with which each variable is theorized to be associated; locus of causality, personal control and stability (hypothesis 3). This required the inclusion of individuals that reported their state guilt and shame and their attributions on a 'no' day. Of the 154 participants that were eligible for this analysis, six participants failed to complete the required questionnaires and therefore 148 participants were included.

Hypothesis 4 was addressed by running two linear regressions and two logistic regressions. Linear regressions were run to assess the ability of SF guilt and GF shame on a ‘no’ day to predict strength of intentions for future engagement in PA. Logistic regressions were run to assess the ability of SF guilt and GF shame on a ‘no’ day to predict whether participants engaged in their next intended PA session. Of the 154 participants that were eligible for these analysis, three participants did not complete the required questionnaires, therefore 151 participants were included.

Results

Bivariate correlations were run prior to analysis to assess potential covariates (Table 1). These will be referred to in the following analyses where appropriate.

[Insert Table 1 here]

Levels of guilt and shame

At baseline, participants reported mean levels of 65.50 ($SD = 6.86$) and 48.27 ($SD = 9.39$) of trait guilt and shame respectively on a range of 1 (low guilt/shame) to 80 (high guilt/shame). There was support for our first hypothesis; participants reported significantly greater state guilt on a ‘no’ day than their ‘yes’ day ($t(142) = -12.41, p < .001$). In addition, participants reported significantly more state shame on their ‘no’ day than they did on their ‘yes’ day ($t(142) = -8.55, p < .001$). In support of hypothesis two, participants reported significantly more state guilt than state shame on a “no” day ($t(150) = -8.31, p < .001$) (descriptive statistics provided in Table 2).

[Insert Table 2 here]

Attributions associated with guilt and shame

There was partial support for hypothesis three assessing the relationship of the causal dimensions predicted to be related to the experience of SF guilt (internal locus of causality, personal control and stability) and the causal dimensions predicted to be associated with GF shame (internal locus

of causality, personal control, and stability) on a ‘no’ day. To control for potential confounders, trait guilt was entered in the first regression as a covariate and did not significantly influence the model. All attributions were entered in step two. The overall model was significant ($R^2 = .08$, $p = .01$), but only locus of causality was significantly associated with SF guilt at an alpha of .05. However, after correcting for inflation, was no longer significant (Table 3). In the second regression trait shame was entered as a covariate and did not significantly influence the model. All attributions were entered as a block in step two. The model was significant ($R^2 = .12$, $p = .01$). Only stability was significantly associated with GF shame after adjustment.

[Insert Table 3 here]

Motivational properties of guilt and shame

Our fourth hypothesis regarding guilt and shame’s influence on PA intention strength and engagement in PA was not supported. The correlation matrix (Table 1) was assessed prior to running the models to assess potential covariates. Results indicated past PA behaviour was related to future PA behaviour ($r = .36$, $p < .001$) and was therefore included in the model.

The first linear regression was used to assess the ability of SF guilt on a ‘no’ day to predict strength of intentions for future PA. Although SF guilt on a ‘no’ day showed a significant association with PA intention strength, this relationship was negative ($r^2 \text{ change} = .04$, $p < .001$, $\beta = -.20$). The second linear regression was used to assess the ability of GF shame on a ‘no’ day to predict strength of intentions for future PA; the results were insignificant (Table 4).

Lastly, two logistic regressions assessed the ability of both SF guilt and GF shame on a ‘no’ day to predict whether participants engaged in their next intended PA session. Our hypothesis regarding guilt and shame’s ability to motivate future PA behaviour was not supported. Both SF guilt and GF shame were not significant predictors of future PA behaviour (Table 4).

[Insert Table 4 here]

1 Discussion

2 To contribute to the understanding of the role of guilt and shame in the self-regulation of PA, the
 3 experiences of these emotions immediately following a missed, as well as an engaged in, PA
 4 session were examined. Further, in recognition of the limited empirical work looking at these two
 5 emotions, the attributions associated with these emotions were explored. Finally, to examine the
 6 motivational capacity of these emotions in the PA context, the effect of a missed PA session on
 7 intentions and engagement in future PA behaviour was measured. This research is novel in that it
 8 is the first, to our knowledge, to measure and explore the acute, real-life experience and
 9 motivational qualities of guilt and shame on PA behaviour.

10 *The experience of guilt and shame related to recent PA*

11 Participants' experience of guilt and shame relative to their recent PA aligned with our
 12 hypotheses. Participants reported higher levels of guilt and shame when they missed as opposed
 13 to when they engaged in an intended PA session (hypothesis 1). This finding is consistent with
 14 both control theory and empirical findings (Castonguay et al., 2015; Flora et al., 2012). In
 15 general, control theories suggest that negative emotions (including guilt and shame) are the by-
 16 product of a person detecting a discrepancy between a current state and a desired state (Carver &
 17 Scheier, 1982). A study by Castonguay and colleagues (Castonguay, Brunet, Ferguson, &
 18 Sabiston, 2012) found that female participants who recognized a discrepancy in their ideal and
 19 actual body weight experienced more negative affect, with larger discrepancies being associated
 20 with participants reporting more intense negative affect. When considered along with past
 21 research, the present findings provide converging support for the control theory precept that
 22 people experience negative affect when they fail to meet or progress towards a desired goal.
 23 Unique contributions of the present findings are that the negative affect experienced by people in
 24 relation to a single, real-life, missed PA session can take the form of guilt and shame reactions.

Guilt and shame are argued to be unique, separate emotions (Tangney, 1996) and are thought to play a significant role in PA self-regulation (Sabiston et al., 2010). In the present study, as hypothesized, participants reported experiencing guilt more strongly than shame following a missed PA session (hypothesis 2). This finding is in line with the distinction that guilt is theorized to be experienced in reaction to a transgression related to a specific *behaviour* whereas shame is felt when it pertains to the *self* (Lewis, 1971). Participants' experience of higher levels of guilt as compared to shame was expected given that, for most participants, missing a PA session should represent a behavioural transgression (PA is a behaviour). This finding is consistent with past empirical work measuring the two emotions in reaction to a behaviour discrepancy in other behavioural domains such as condom use (Hynie et al., 2006) and recycling patterns (Elgaaiied, 2012). Empirical work measuring guilt and shame in the context of PA is limited, with a focus being primarily on the role of these emotions in relation to body image (Castonguay et al., 2012; Castonguay et al., 2015; Castonguay et al., 2017; Sabiston et al., 2010). The present study was the first to look at the relationship between real-life PA adherence and the resulting levels of state guilt and shame. The finding that guilt was experienced more strongly than shame, supports the idea that these emotions are experienced as unique separate emotions in the context of PA behaviours.

Attributions of guilt and shame

Offering further support for the unique differences of the two emotions are their associated antecedents. The experience of guilt should be elicited when an event is viewed as controllable, unstable and internal whereas shame would be elicited when the event is viewed as uncontrollable, stable, and internal (Tracy & Robins, 2004; Tracy & Robins, 2006; Weiner, 1985). However, the present study does not fully support the hypothesis. SF guilt was associated with internal locus of causality (but not with controllability and stability) as hypothesized

1 (hypothesis 3). That is, people's guilt in response to a missed PA session was positively related
 2 to the extent to which they saw the cause of the missed session as being something to do with
 3 *them*. This finding however may be due to type I error and given that controllability and stability
 4 did not emerge as significant correlates of guilt, it is difficult to speculate on the type of internal
 5 cause to which participants may be attributing their missed PA session. In contrast, the
 6 experience of GF shame was associated with participants attributing the cause of the missed PA
 7 session to something stable, which is consistent with attributions speculated to be associated with
 8 shame. However, it is surprising that internality did not emerge as a significant correlate of shame
 9 given that, like guilt, shame is a self-conscious emotion and so should involve attributing failure
 10 to something internal (Lewis, 1971). Interestingly, these inconsistencies are in line with previous
 11 attributions research which has failed to produce consistent results, particularly in the context of
 12 actual events. In their work assessing the direct and indirect effects of causal attributions on
 13 student success, Russell and McAuley (1986) found conflicting results in the relationships
 14 between specific causal attributions and affective reactions to success and failure. Causal
 15 attributions may make independent contributions to affective reactions, and their joint, or
 16 synergistic, effects may result in different affective reactions depending on the situation (Russell
 17 & McAuley, 1986; Weiner, 1979). It is postulated that causal attributions may not be important
 18 determinants of affective reactions in actual events, and may only determine affective reactions in
 19 artificial, hypothetical scenarios (Russell & McAuley, 1986). Furthermore, differing behavioural
 20 domains and settings may produce varying, distinct attributional characteristics. In our study, it
 21 may be that the real-life experience of a single missed exercise session is not powerful enough to
 22 have the predicted attributional effects. Repeated missed sessions that are attributed repeatedly to
 23 a common cause may be more likely to have the effects predicted by theory. Nonetheless, the
 24 finding that guilt and shame are associated with different attributional dimensions supports the

unique qualities of the two. This supports the need for further exploration of these two emotions and their role in PA behaviour in a real-life context.

Motivational properties of guilt and shame

The hypothesis regarding the motivational outcomes of negative emotions (hypothesis 4) was, for the most part, not supported. While control theories predict that negative emotions should lead to motivation for, and engagement in, reparative behaviour, we advanced more refined and specific hypotheses for each guilt and shame based on past descriptions of the motivational qualities of the two emotions. Guilt is recognized for its association with proactive direction (Tracy & Robins, 2004) and therefore was hypothesized to motivate PA behaviour (as captured by intentions for and actual engagement in PA). Conversely, shame was hypothesized to lead to disengagement from these behaviours given this emotion's proposed association with separation and distance (Tracy & Robins, 2004). Instead, our results indicated that SF guilt had a *negative* relationship with PA intentions while GF shame was not significantly related. Further, neither emotion was related to participants' reported engagement in their next intended PA session.

The present general pattern of findings was not consistent with past research or theory. Castonguay and colleagues (2017) found shame to be associated with lower levels of PA following a cancer diagnosis. Readers should note that the assessment of shame in the Castonguay et al (2017) study pertained to body-related shame while our assessment was in response to a missed PA session, so these findings are not directly comparable. Additionally, the present finding that guilt was *negatively* related to intentions to engage in PA challenges the central tenet of control theory, and previous research on self-conscious emotions (Tracy & Robins, 2004) that negative affect plays an adaptive role in self-regulation. This finding is more in line with contentions of self-determination theory (Ryan & Deci, 2000) which argue that negative emotion can be detrimental to successful self-regulation. Researchers have found that

1 introjected regulation – or behaviour enacted for the purpose of the *avoidance* of guilt and shame
 2 (Ryan & Deci, 2000) – is positively correlated with PA (Brunet & Sabiston, 2011; Edmunds,
 3 Ntoumanis, & Duda, 2006; Wilson, Rodgers, Fraser, & Murray, 2004). Similarly, proponents of
 4 self-determination theory would argue that the experience of the self-conscious emotion of pride
 5 (an intrinsic form of motivation) may be a stronger predictor of intention for and engagement in a
 6 subsequent PA session (Mack, Kouali, Gilchrist, & Sabiston, 2015). Negative emotions receive
 7 the most emphasis within control theory and was therefore the focus of the present study.
 8 However, whether it is the actual experience of this emotion, or the avoidance of it, should be
 9 further explored in the exercise context.

10 There may be other reasons why the present findings do not align with this tenet of
 11 control theories and previous findings. Firstly, as previously discussed, this study examined
 12 negative emotional responses to a *single* behavioural transgression and the acute effects of these
 13 emotions on subsequent self-regulation. This focus may not have captured the larger context of
 14 participants' recent PA behaviour and this information may be important. Proponents of control
 15 theory argue that repeated interruption to one's behaviour causes accumulating distress to the
 16 individual (Burke, 1991). As individuals' experience of negative affect (namely guilt) becomes
 17 more intense, they become more motivated to adhere to tasks (Flynn & Schaumberg, 2012).
 18 Therefore, in the present study participants may not have experienced negative affect intensely
 19 enough to result in motivational behaviours.

20 Secondly, control theory proposes that negative affect and reparative action are initiated
 21 when there is a failure to progress towards a desired goal. Participants in the current study were
 22 not asked to indicate their desired level of PA or set a PA goal. Therefore, it is unknown whether
 23 a missed exercise session elicited feelings of failure of goal progression, so subsequently not
 24 prompting reparative action.

Finally, and as previously discussed, GF shame and SF guilt were differently related to PA intentions (but not behaviour); SF guilt was negatively related with intentions to engage in the next PA session while GF shame was not related to intentions. When considered in aggregate, relationships involving shame and guilt in this study often played out differently for each emotion, which suggests that shame and guilt are unique. However, when considered from a statistical standpoint these variables have substantial overlap ($r = .79$), leading to the creation of SF guilt and GF shame to tease apart the two constructs. The incongruity between their distinct relationship with PA while possessing strong statistical overlap may strengthen the need for future research to explore the unique role of these emotions within the PA domain in order to further inform the nature of their relationship.

Strengths and limitations

The present study offers many advancements. The majority of research utilizing control models assess *general* negative affect. Our findings adhere to recommendations (Forgas, 2000) to investigate specific emotional reactions and their relationship with behaviour. We were, to our knowledge, among the first to explore the nature of the experience of guilt and shame as a reflection of PA behaviours and the first to explore the motivational properties of these emotions as proposed by control theorists. Also, this study teases out the trait and state characteristics of these emotions and provides the first examination of participants' emotional reactions to a single PA session and examined the acute effect of a discrepancy between intended and engaged in behaviour. By assessing reactions to a single PA session, this study provides insights into whether, and to what extent, negative emotions associated with a single behavioural transgression exist and exert a motivational influence on subsequent behaviour.

The limitations of this study should be noted to guide future research on PA and self-conscious emotions. There were a few methodological constraints that were limiting. Namely,

1 participants' emotional reactions to a single-missed PA session were assessed and this short
2 period of time may not have been sufficient for gathering strong enough affective responses to
3 support some of our hypotheses. Additionally, the number of sessions the participants intended to
4 engage in was not assessed. Asking participants to set a PA goal and assessing the subsequent
5 engagement and affectual response may provide additional support for the tenets of control
6 theory. Due to the observational nature of our study design causal inference cannot be inferred
7 and following participants for a longer duration would offer opportunities not afforded by the
8 present design. Such a prospective design would provide an opportunity to consider whether
9 guilt and shame reactions differ in their intensity and motivational properties when they consider
10 the broader perspective of one's general recent PA, as opposed to a single session.

11 Our sample was, on average, highly active females. There is a possibility that less active
12 participants experience a different pattern of self-conscious emotions than active participants, or
13 that their experience of self-conscious emotions have different antecedents and consequences. In
14 addition, men were underrepresented. Low male recruitment has been noted as a common
15 challenge in health research (Markanday, Brennan, Gould, & Pasco, 2013) and efforts to
16 overcome this should be explored in the future.

17 Although 234 participants completed our study, only 154 reported a missed PA session
18 and of these only 28 followed a missed PA session with another missed PA session. Future
19 researchers should be aware that they may have to sample many participants to encounter enough
20 people who report to follow a missed PA session with another missed session. The number of
21 participants failing to report missing intended PA may be due to self-report bias, or participants
22 displaying social desirability bias and responding in a way they believe is the approved response.
23 The use of objective measures is becoming increasingly recommended in the PA literature due to

the inaccuracies in self-reporting (Harris et al., 2017). Future research should be aware of these reporting tendencies and employ additional measures of PA.

Lastly, caution should be taken in the interpretation of the attribution dimension of stability. In the original analysis of the CDS-II scale stability scored .24. Following examination of item loadings, we removed one item from the scale and were able to improve the score to .54 however this is still low and may impact conclusions drawn on this dimension.

Implications for practice and future research

The findings from this study suggest that exercisers experience guilt and shame when they miss a PA session, but these emotions did not impact intentions or behaviour as hypothesized. Because these findings were at odds with past research, it would be premature to make suggestions about how guilt and shame can be harnessed, or alleviated, to motivate subsequent PA in interventions. Researchers and clinicians are encouraged to consider guilt and shame as distinct emotions given their differential levels and antecedents within our data. It is recommended to assess the two emotions separately while accounting for their trait levels. Researchers are encouraged to continue to explore the role of shame and guilt in PA to determine the nature of the role they play in PA motivation and behaviour.

Conclusion

This study explored several antecedents and outcomes related to the experience of guilt and shame. The two self-conscious emotions of guilt and shame have both shown to be experienced in the presence of behaviour discrepancy, with guilt having slightly elevated levels over shame. However, at this time we cannot conclusively report on their ability to predict PA behaviour. Future research on self-conscious emotions and PA will help elucidate the inconsistent findings regarding the relationship of guilt and shame within a PA context.

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